National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material® 1256b

Aluminum Alloy 380

(In Cooperation with ASTM International)

This Standard Reference Material (SRM) is intended primarily for use in evaluating instrumental methods of analysis including glow discharge optical emission spectrometry, spark source optical emission spectrometry, and X-ray fluorescence spectrometry. A unit of SRM 1256b consists of a disk approximately 6.3 cm in diameter and 1.9 cm thick.

The certified values for 12 elements in SRM 1256b are listed in Table 1. The user should note that there are two certified values given for Ti, two for V, and two for Sr. Each unit of SRM 1256b carries a serial number. The correct values for Ti, V, and Sr are the values associated with the serial number of the unit. Reference values for two elements are listed in Table 2. For all elements, values are reported as mass fractions [1]. Value assignment categories are based on the definition of terms and modes used at NIST for chemical reference materials [2].

Certified Values: A NIST certified value is a value for which NIST has the highest confidence in its accuracy, in that all known or suspected sources of bias have been investigated or accounted for by NIST. A certified value is the present best estimate of the true value based on the results of analyses performed at NIST and collaborating laboratories using the test methods listed in Table 3. The uncertainty listed with the value is an expanded uncertainty based on a 95 % confidence interval [3] and is calculated according to the method in the ISO and NIST Guides [4].

Reference Values: Reference values are non-certified values that are the present best estimates of the true values. However, the values do not meet the NIST criteria for certification and are provided with associated uncertainties that may not include all sources of uncertainty. The uncertainty listed with the value is an expanded uncertainty based on a 95 % confidence interval [3] and is calculated according to the method in the ISO and NIST Guides [4].

Expiration of Certification: The certification of this SRM is valid indefinitely, within the uncertainty specified, provided the SRM is handled and stored in accordance with the instructions given in this certificate (see "Instructions for Use"). However, the certification will be nullified if the SRM is damaged or contaminated.

Stability: This material is considered to be stable during the period of certification. NIST will monitor this material and will report any significant changes in certification to the purchaser. Registration (see attached sheet) will facilitate notification.

The coordination of the technical measurements for certification was under the direction of J.R. Sieber of the NIST Analytical Chemistry Division.

Analytical measurements for certification of this SRM were performed by J. R. Sieber and M.R. Winchester of the NIST Analytical Chemistry Division.

Statistical consultation for this SRM was provided by D.D. Leber of the NIST Statistical Engineering Division.

Stephen A. Wise, Chief
Analytical Chemistry Division

Gaithersburg, MD 20899
Certificate Issue Date: 04 April 2006

Robert L. Watters, Jr., Chief
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The support aspects involved in the issuance of this SRM were coordinated through the NIST Measurement Services Division.

INSTRUCTIONS FOR USE

The test surface is the side opposite to the labeled surface, which includes the SRM number and a serial number. The entire thickness of the unit is certified. Each packaged disk has been prepared by finishing the test surface using a milling machine. The user must determine the correct surface preparation procedure for each analytical technique. For example, preparation for glow discharge optical emission measurements at NIST involved grinding the surface with abrasive paper. The user is cautioned to use care when either resurfacing the disk or performing additional polishing as these processes may contaminate the surface. The material should be stored in its original container in a cool, dry location.

This material was tested using both the solid disks and chips prepared from the disks. The certified values are considered to be representative of the overall average composition of the material. The casting method results in material that is relatively uniform in composition regardless of the distance from the center of the piece. Measurements using a small X-ray beam (approx. 3 mm × 4 mm ellipse) showed localized areas of high X-ray count rate for Ti, V, Mn, Fe, Cu, Zn, and Ga. Therefore, regardless of the method employed, it is recommended to follow accepted standard methods of test for Al alloys, which may specify the manner in which measurement locations are chosen and the number of locations to be measured.

The casting method used to prepare this material may result in different amounts of grain refiner in each casting. The user is cautioned to note the serial number of the disk and use the appropriate certified values for Ti, V, and Sr from Table 1 and footnotes b, c and d.

Table 1. Certified Values for SRM 1256b Aluminum Alloy 380

Constituent	Value (mass fraction) (%)	Expanded Uncertainty [a] (mass fraction) (%)	Coverage Factor (*k*)
Si	9.362	0.086	2.0
Fe	0.865	0.011	2.1
Cu	3.478	0.074	2.0
Mn	0.3857	0.0043	2.3
Mg	0.0637	0.0040	2.0
Ni	0.4135	0.0081	2.0
Zn	1.011	0.030	2.0
Ti [b]	0.0877	0.0037	2.2
Ti [c]	0.0859	0.0016	2.6
V [b]	0.0212	0.0021	2.0
V [c]	0.0203	0.0020	2.0
Cr	0.0572	0.0011	2.0
Sr [b]	0.0188	0.0021	2.0
Sr [c]	0.0173	0.0015	2.0
Pb	0.1075	0.0064	2.0

[a] The assigned value is an unweighted mean of the results from three analytical methods across multiple laboratories. The uncertainty listed with the value is an expanded uncertainty about the mean, with coverage factor *k*, calculated by combining a between-method variance with a pooled, within-method variance following the ISO and NIST Guides [4,5].

[b] These values and associated uncertainty estimates for Ti, V and Sr must be used with units having serial numbers 1500 through 1588, inclusive.

[c] These values and associated uncertainty estimates for Ti, V and Sr must be used with units having serial numbers 1589 through 1678, inclusive.

Table 2. Reference Values for SRM 1256b Aluminum Alloy 380

Constituent	Value (mass fraction) (mg/kg)	Expanded Uncertainty [(a)] (mass fraction) (mg/kg)	Coverage Factor (*k*)
Ga	183	41	2.0
Sn	91	43	2.0

[(a)] The assigned value is an unweighted mean of the results from three analytical methods across multiple laboratories. The uncertainty listed with the value is an expanded uncertainty about the mean, with coverage factor *k*, calculated by combining a between-method variance with a pooled, within-method variance following the ISO and NIST Guides [4,5].

Table 3. Analytical Methods

Element	Methods
Si	GD-OES; ICP-OES; SS-OES
Fe	GD-OES; ICP-OES; SS-OES
Cu	GD-OES; ICP-OES; SS-OES
Mn	GD-OES; ICP-OES; SS-OES
Mg	GD-OES; ICP-OES; SS-OES
Ni	GD-OES; ICP-OES; SS-OES
Zn	GD-OES; ICP-OES; SS-OES
Ti	GD-OES; ICP-OES; SS-OES
V	GD-OES; ICP-OES; SS-OES
Cr	GD-OES; ICP-OES; SS-OES
Ga	GD-OES; ICP-OES; SS-OES
Pb	GD-OES; ICP-OES; SS-OES
Sr	GD-OES; ICP-OES; SS-OES
Sn	GD-OES; ICP-OES; SS-OES

Methods Key:

GD-OES (Glow Discharge Optical Emission Spectrometry at NIST)
ICP-OES (Inductively-Coupled Plasma Optical Emission Spectrometry at Cooperating Laboratories)
SS-OES (Spark Source Optical Emission Spectrometry at Cooperating Laboratories)

Cooperating Laboratories: Analytical determinations for certification of this SRM were performed by the following laboratories:

Alcan International Limited, Arvida Research and Development Centre (Jonquière, Québec, Canada); H. Hamouche. Aluminum Company of America, Alcoa Technical Center, Alcoa Center (Pennsylvania, USA); M. Ruschak.

Material Preparation: The material for SRM 1256b was obtained in the form of four castings prepared by the Aluminum Company of America[1]. Titanium was added for grain refinement of the alloy. The method of addition may cause the Ti, V, and Sr contents to change from one casting to the next. The castings were cut and packaged at NIST under the supervision of D. F. Friend and M. P. Cronise of the Measurement Services Division. Homogeneity testing was performed by Alcan International Limited using spark source optical emission spectrometry and by NIST using micro X-ray fluorescence spectrometry.

[1] Certain commercial equipment, instruments, or materials are identified in this certificate in order to specify adequately the experimental procedure. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the materials or equipment identified are necessarily the best available for the purpose.

REFERENCES

[1] Taylor, B.N.; *Guide for the Use of the International System of Units (SI)*; NIST Special Publication 811, U.S. Government Printing Office: Washington, DC (1995); available at http://www.physics.nist.gov/Pubs.

[2] May, W.; Parris, R.; Beck, C.; Fassett, J.; Greenberg, R.; Guenther, F.; Kramer, G.; Wise, S.; Gills, T.; Colbert, J.; Gettings, R.; MacDonald, B.; *Definitions of Terms and Modes Used at NIST for Value-Assignment of Reference Materials for Chemical Measurements*; NIST Special Publication 260-136; U.S. Government Printing Office: Gaithersburg, MD (2000); available at http://www.cstl.nist.gov/nist839/NIST_special_publications.htm.

[3] Hahn, G. J., and Meeker, W. Q.; *Statistical Intervals: A Guide for Practitioners*; John Wiley & Sons, Inc.: New York (1991).

[4] ISO; G*uide to the Expression of Uncertainty in Measurement*; ISBN 92-67-10188-9, 1st ed.; International Organization for Standardization: Geneva, Switzerland (1993); see also Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297; U.S. Government Printing Office: Washington, DC (1994); available at http://physics.nist.gov/Pubs/.

[5] Levenson, M.S.; Banks, D.L.; Eberhardt, K.R.; Gill, L.M.; Guthrie, W.F.; Liu, H.K.; Vangel, M.G.; Yen, J.H.; Zhang, N.F.; *An Approach to Combining Results from Multiple Methods Motivated by the ISO GUM*; J. Res. Natl. Inst. Stand. Technol., Vol. 105, pp. 571–579 (2000).

Users of this SRM should ensure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: telephone (301) 975-6776; fax (301) 926-4751; e-mail srminfo@nist.gov; or via the Internet at http://www.nist.gov/srm.